

STRUCTURE AND METHOD FOR FABRICATING SEMICONDUCTOR  
STRUCTURES AND DEVICES UTILIZING THE FORMATION OF A COMPLIANT  
SUBSTRATE FOR MATERIALS USED TO FORM THE SAME AND  
PIEZOELECTRIC STRUCTURES HAVING CONTROLLABLE OPTICAL SURFACES

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ABSTRACT OF THE DISCLOSURE

High quality epitaxial layers of monocrystalline materials can be grown  
overlying monocrystalline substrates such as large silicon wafers by forming a  
compliant substrate for growing the monocrystalline layers. An accommodating buffer  
10 layer comprises a layer of monocrystalline oxide spaced apart from a silicon wafer by  
an amorphous interface layer of silicon oxide. The amorphous interface layer  
dissipates strain and permits the growth of a high quality monocrystalline oxide  
accommodating buffer layer. The accommodating buffer layer is lattice matched to  
both the underlying silicon wafer and the overlying monocrystalline material layer.  
15 Any lattice mismatch between the accommodating buffer layer and the underlying  
silicon substrate is taken care of by the amorphous interface layer. In addition,  
formation of a compliant substrate may include utilizing surfactant enhanced epitaxy,  
epitaxial growth of single crystal silicon onto single crystal oxide, and epitaxial growth  
of Zintl phase materials. Further, various shaped piezoelectric structures having  
20 optical surfaces may be disposed on the overlying monocrystalline layer for optical  
switching and controlled manipulation of light signals.